

3(1)

AUTHOR: Zhevakin, S.A.

SOV/33-36-2-9/27

TITLE: The Evaluation of Non-Adiabatic Stellar Pulsations by Use of a Discrete Model

PERIODICAL: Astronomicheskii zhurnal, 1959, Vol 36, Nr 2, pp 269-282 (USSR)

ABSTRACT: The author develops a method for the calculation of radial non-adiabatic stellar pulsation with the aid of a discrete model of a stellar envelope. It is pointed out that this method requires much less calculation expenditure than the methods proposed by Woltjer [Ref 13, 14] and Rosseland [Ref 17]. The author formulates the conditions under which the new method is applicable. He constructs a discrete multilayer spherical model of a pulsating stellar envelope and investigates the equations of motion of this model. - There are 1 figure, and 40 references, 23 of which are Soviet, 9 English, 4 German, 3 Dutch, 1 Indian.

ASSOCIATION: Radiofizicheskiy institut Gor'kovskogo gos. universiteta imeni N.I. Lobachevskogo (Radiophysical Institute at the Gor'kiy State University imeni N.I. Lobachevskiy)

SUBMITTED: February 10, 1958

Card 1/1

3(1)

AUTHOR: Zhevakin, S.A.

SOV/33-36-3-2/29

TITLE: On the Theory of Stellar Pulsations V (Spherical Discrete Model of Several Layers)

PERIODICAL: Astronomicheskii zhurnal, 1959, Vol 36, Nr 3, pp 394-409 (USSR)

ABSTRACT: The present paper is a continuation of [Ref 12, 3, 2, 28] and contains a theory of stellar pulsations. The author uses a spherical discrete model of several layers, where the change of the temperature gradient is considered for the appearing oscillations. Thereby an essential improvement of the qualitative results of [Ref 2] is obtained. The consideration of the long-periodic variable of the type RR Herculis and α Canis Majoris is new. The behavior of these stars corresponds well to the theory of the author. The most essential results are: If the envelope contains ca. 15 % helium and if there appears a radiative energy transfer in the zone of critical He II ionization, then in the envelope there appears a negative dissipation, sufficient for maintaining the oscillations of the star. The influence of the parameters of the stellar envelope on the amplitude and phase of

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On the Theory of Stellar Pulsations V (Spherical
Discrete Model of Several Layers)

SOV/33-36-3-2/29

oscillations of the radiative flow from the star is investigated.
The data of the parameter values corresponding to the single
types of pulsation are improved.

There are 6 tables, 3 figures, and 32 references, 14 of which are
Soviet, 4 German, 2 Dutch, 1 Canadian, 3 English, and 8 American.

ASSOCIATION: Radiofizicheskiy institut pri Gor'kovskogo gosudarstvennogo universi-
teta imeni N.I.Lobachevskogo (Radiophysical Institute at the Gor'kiy State
University imeni N.I.Lobachevskiy)

SUBMITTED: May 19, 1958

Card 2/2

ZHEVAKIN, S.A.

Once more on the central and peripheral theories of the pulsation
of stars. Vop.kosm. 7:324-332 '60. (MIRA 13:11)
(Stars, Variable)

ZHEVAKIN, S.A.

Phase and amplitude variations of oscillations of the radiation
flux passing through a nonadiabatic envelope of a pulsating star.
Astron.zhur. 37, no.3:443-457 My-Je '60. (MIRA 13:6)

1. Radiofizicheskiy institut Gor'kovskogo gosudarstvennogo
universiteta imeni N.I. Lobachevskogo.
(Stars, Variable)

S/033/60/037/005/007/024

E032/E514

AUTHOR: Zhevakin, S. A.

TITLE: On a Common Error in the Theory of Stellar Variability ✓

PERIODICAL: Astronomicheskii zhurnal, 1960, Vol.37, No.5,
pp. 842-847

TEXT: In a number of papers attempting to explain the existence of the phase difference between light variations and radius variations in pulsating stars, use is made of the analogy between this phase shift and the phase lag which occurs during the propagation of thermal waves through a non-pulsating medium. This analogy was first noted by Eddington and was later developed by Rosseland. The present author claims that he showed in Ref.4 ✓ that this analogy is quite false. However, in recent years the analogy was employed by Cox and Whitney (Ref.5) and Cox (Ref.6) who derived various formulae from it and applied them to the theory of non-adiabatic pulsations of stars and used them in the "semi-empirical" derivation of the period-luminosity relation for classical Cepheids and Cepheids in globular clusters. The incorrect Rosseland-Cox-Whitney formula (Eq.1 of Ref.5) was also used by Wallerstein (Ref.7) in his calculation of the phase shift
Card 1/3

S/033/60/037/005/007/024
E032/E514

On a Common Error in the Theory of Stellar Variability

for the various models of the variables M5 No.42 and W Virginis. The present paper develops the criticism given in Ref.4 in greater detail. It is shown that Rosseland's formula for the phase shift for various stars, which is based on the above analogy, can lead, depending on the adopted stellar model, to a value of the phase shift which differs quite considerably from the true value. This is due to the fact that the term $pd/dt (1/\rho)$, which was neglected by Rosseland, is in fact of the same order of magnitude as the term $(\text{div } F)/\rho$. It is also argued that the theory of non-adiabatic pulsations developed by Cox (Refs. 20 and 6) and Cox and Whitney (Ref.5), although based on the correct idea, i.e. the assumption that the peripheral zone of critical ionization is responsible for the pulsations, contains fundamental errors and the majority of statements contained in these papers are incorrect. They will be discussed in greater detail in a future publication. Reference is made to numerous publications by the present author in which a correct treatment of this problem is said to be given. There are 28 references: 20 Soviet and


Card 2/3

S/033/60/037/005/007/024
E032/E514

On a Common Error in the Theory of Stellar Variability
8 English.

ASSOCIATION: Radiofizicheskiy institut Gor'kovskogo gos.
universiteta imeni N. I. Lobachevskogo
(Radiophysical Institute of the Gor'kiy State
University imeni N. I. Lobachevskiy)

SUBMITTED: October 6, 1959



Card 3/3

ZHEVAKIN, S.A.; NAUMOV, A.P.

Coefficient of the absorption of electromagnetic waves by water
vapor in the 10 \pm 2cm. band. Izv. vys. ucheb. zav.; radiofiz.
6 no.4:674-694 '63. (MIRA 16:12)

ZHEVAKIN, S.A.; NAUMOV, A.P.

Absorption of electromagnetic radiation by water vapors on
10 μ ÷ 2cm waves in the upper atmospheric strata. Geomag. 1
aer. 3 no.4:666-678 JI-Ag '63. (MIRA 16:11)

1. Radiofizicheskiy institut pri Gor'kovskom gosudarstvennom
universitete.

ZHEVAKIN, S. A.

Incorrectness of the simplified criterium of pulsational
instability of a star proposed by Cox and Whitney. Astron.
zhur. 40 no.1:189-196 J-F '63. (MIRA 16:1)

(Stars, Variable)

L 32058-66 EWT(1)
ACC NR: AR6016173

SOURCE CODE: UR/0058/65/000/011/D012/D012

AUTHOR: Zhevakin, B. A.; Strelkov, G. M.

TITLE: On the form of the spectral line due to collisions

SOURCE: Ref. zh. Fizika, Abs. 11D86

REF SOURCE: Tr. Komis. po spektroskopii. AN SSSR, t. 3, vyp. 1, 1964, 39-41

TOPIC TAGS: spectral line, light scattering, kinetic equation, molecular spectrum

ABSTRACT: It is shown that an error has crept into the derivation of the formula for the contour of the spectral line in the well known paper of Van-Vleck and Weisskopf. For an idealized model of the optical oscillator the correct form of the spectral line can be obtained by the kinetic-equation method. This method leads to the same spectral-line shape under three different assumptions concerning the mechanism of the collision between the optical oscillator and the molecules surrounding it. This spectral-line shape, unlike the spectral-line shape given by Van-Vleck and Weisskopf, makes it possible to describe satisfactorily the rotational spectrum of water vapor. [Translation of abstract]

SUB CODE: 20

Card 1/1

L 23159-66 EWT(1) IJP(c)

ACC NR: AR6016178

SOURCE CODE: UR/0058/65/000/011/D014/D014

AUTHOR: Zhevakin, S. A.; Naumov, A. P.

TITLE: Calculation of rotational spectrum of water-vapor molecules

SOURCE: Ref. zh. Fizika, Abs. 11D100

REF SOURCE: Tr. Komis. po spektroskopii. AN SSSR, t. 3, vyp. 1, 1964, 42-51

TOPIC TAGS: molecular spectrum, water vapor, absorption coefficient, absorption spectrum, dielectric constant, optic transition, spectral line, line width, kinetic equation

ABSTRACT: An electronic computer was used to calculate the absorption coefficient in the range from 10 μ to 32 cm and the dielectric constant in the range from 0.1 mm to 2 cm of water vapor with account of 871 rotational transitions. Matrix elements of the direction cosines for the model of a rigid axially-symmetrical top, molecular terms with account of centrifugal perturbation, line halfwidths calculated by the Anderson theory, and a spectral line shape obtained from solution of the kinetic equation were used in the calculations. The results of the calculations are in good agreement with experiment. [Translation of abstract]

SUB CODE: 20

Card 1/1

ACCESSION NR: AP4043666

S/0109/64/009/008/1327/1337

AUTHOR: Zhevakin, S. A.; Naumov, A. P.

TITLE: Absorption of centimeter and millimeter waves by atmospheric water vapor

SOURCE: Radiotekhnika i elektronika, v. 9, no. 8, 1964, 1327-1337

TOPIC TAGS: radio, radio communication, radio wave, radio wave absorption, radio wave atmospheric absorption

ABSTRACT: The coefficient of absorption of (0.7 mm — 32 cm) radio waves by atmospheric water vapor is computed on the basis of a kinetic equation developed by the authors earlier (IVUZ. Radiofizika, 1963, 6, 4, 674, and Geomagnetizm i aeronomiya, 1963, 3, 4, 666). The shape of the water spectral line determined from that equation is credited with a better agreement than Van-Vleck-Weisskopf's line shape with published experimental data, yet no complete

Card 1/2

ACCESSION NR: AP4043666

agreement between theory and experiment has been reached for the out-of-resonance range. For the 2-8-mm band, the discrepancy is 1.5 times, which is better than the 3 times previously attained. "The authors take this opportunity to thank A. I. Rakova and M. B. Flaksman for their help in processing the results." Orig. art. has: 4 figures and 6 formulas.

ASSOCIATION: none

SUBMITTED: 28Feb63

ENCL: 00

SUB CODE: EC

NO REF SOV: 009

OTHER: 035

Card 2/2

L 11819-66 EWT(d)/EWT(1) FB/GW

ACC NR: AP6002294

SOURCE CODE: UR/0141/65/008/006/1100/1109

AUTHOR: Zhevakin, S. A.; Naumov, A. P.

ORG: Scientific Research Institute of Radio Physics at Gorky University (Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete)

TITLE: Some problems in calculating and measuring the absorption of millimeter and submillimeter waves in atmospheric water vapor

SOURCE: IVUZ. Radiofizika, v. 8, no. 6, 1965, 1100-1109

TOPIC TAGS: millimeter wave, submillimeter wave, radio wave absorption

ABSTRACT: Theoretical values of the absorption factor γ for a range of 10μ -- 32 cm were reported in recent of the authors' works (e.g., Rad. i elektronika, no. 9, p. 1327, 1964); measured values of γ were 1.5--2 times higher than the theoretical for the 2--8-mm band and for the submillimeter ($\lambda > 60 \mu$) band. The present article examines the temperature of solar radiation attenuated by the Earth's atmosphere, the absorption factor of atmospheric water vapor, and the temperature of atmospheric radiation. It is preferable to measure the absorption in the submillimeter range by solar radiation than by atmospheric radiation, despite the fact that the solar-radiation method is applicable only when the antenna solar temperature is rather high and substantially varies with the zenith distance. Possible causes of the above discrepancy are briefly discussed in the light of current (1960-65) Western publications. Orig. art. has: 5 figures and 2 formulas. [93]

SUB CODE: 17,09 / SUBM DATE: 14May65 / ORIG REF: 017 / OTH REF: 015 / ATD PRESS: 418
Card 1/1 H(1)
UDC: 621.371.166.22

L 00861-66 EWG(j)/ENT(m)/EPF(c)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5015860

UR/0109/65/010/006/0987/0996

621.371.166

AUTHOR: Zhevakin, S. A.; Naumov, A. P.

TITLE: Calculating the coefficient of absorption of centimeter and millimeter waves by the atmospheric oxygen 27

SOURCE: Radiotekhnika i elektronika, v. 10, no. 6, 1965, 987-996

TOPIC TAGS: wave absorption by oxygen, centimeter wave, millimeter wave

ABSTRACT: A review is presented of the published works on the coefficient of absorption of microwaves by oxygen. The coefficient of absorption is calculated for a 2.2 mm-10 cm band with a line form obtained by solving a kinetic equation. The discrepancy between the above results and the absorption coefficient estimated with the (foraneous) van-Vleck-Keesom formula is insignificant at wavelengths of 4.3 mm and over (at 2.2 mm the discrepancy is 1.5 times). By comparing the calculated absorption coefficient with experimental results, in the 4.3-6.7-mm band, a mean half-width of the spectral line of 0.81 Gc is determined (for 760 torr). The equivalent (expressed) radio-wave path in the atmospheric oxygen slightly depends on frequency, and is equal to 5.0-6.3 km, for a polytropic atmosphere model, which coincides with a former 1/2 characteristic O_2 - absorption height for an exponential atmosphere model.

L 00861-66

ACCESSION NR: AP5C.5806 2

Under resonance conditions, within 56--64 Gc, the equivalent path depends on frequency considerably and can be as high as 8--21 km. "In conclusion, the authors wish to thank I. A. Rakova and M. B. Flaksman for their calculation work on a digital computer." Orig. art. has: 2 figures, 10 formulas, and 1 table.

ASSOCIATION: none

SUBMITTED: 28 Feb. 64

ENCL: 00

SUB CODE: EC

NO REF SOV: 014

OTHER: 045

Card 2/2

L 37940-66 EWT(1)/FCC

GN

SOURCE CODE: UR/0141/66/009/003/0433/0450

ACC. NR: AP6022069

AUTHOR: Zhevakin, S. A.; Naumov, A. P.

ORG: Scientific-Research Institute of Radiophysics, Gor'kiy University
(Nauchno-issledovatel'skiy radiofizicheskiy institut pri Gor'kovskom universitete)

TITLE: Absorption of 3-7.5-mm electromagnetic waves in the Earth atmosphere

SOURCE: IVUZ. Radiofizika, v. 9, no. 3, 1966, 433-450

TOPIC TAGS: electromagnetic wave absorption, atmospheric absorption, atmospheric physics

ABSTRACT: As the seasonal variations of absorption factors of O_2 and H_2O and characteristic absorption altitudes are needed for many geophysical problems (including accurate weather prediction) and as this data is lacking in the available literature, the present article offers some results of calculations made for winter and summer for the 1960 standard atmosphere; 50-60° N. latitude; $\lambda = 3-7.5$ mm (40-100 Gc). Out of O_2 and H_2O resonance, the seasonal variations of the total absorption factor reach 30-40%. For higher altitudes, the H_2O contribution falls off fairly rapidly. The characteristic absorption altitudes for vapor and oxygen monomers are: 1.56 km and 4.8 km (summer) or 1.48 km and 4.3 km (winter), respectively. Within the resonance regions, the characteristic altitudes substantially depend on the wavelength. The relation between the total absorption factor and the altitude is nonexponential. "The authors wish to thank I. A. Rakova for carrying out the calculations on a BESM-2 computer and for her help in the data processing."

UDC: 621.371.166.22

Card 1/2

L 37940-66

ACC NR: AP6022069

Orig. art. has: 11 figures, 10 formulas, and 3 tables.

[03]

SUB CODE: 04, 08 / SUBM DATE: 18Jun65 / ORIG REF: 020 / OTH REF: 017

Card 2/2 mclp

ACC NR: AP7002382

SOURCE CODE: UR/0020/66/171/005/1061/1064

AUTHOR: Viktorova, A. A.; Zhevakin, S. A.

ORG: Scientific Research Institute of Radiophysics at Gor'kiy State University
im. N. I. Lobachevskiy (Nauchno-issledovatel'skiy radiofizicheskiy institut pri
Gor'kovskom gosudarstvennom universitete)

TITLE: Atmospheric absorption of microwaves by water vapor dimers

SOURCE: AN SSSR. Doklady, v. 171, no. 5, 1966, 1061-1064

TOPIC TAGS: radio wave, radio transmission, radio wave absorption

ABSTRACT: The author reviews the theory of microwave absorption by atmospheric gases and water vapor. Although measurements of microwave absorption by oxygen are in good agreement with those predicted, the results of measurements of water vapor absorption are about two times greater than theoretical values. Such a large discrepancy between measured and theoretical data cannot be explained by the presence of vapor isotopes or by an improperly chosen line breadth constant. The authors show that anomalous absorption by water vapor can be explained by the presence of dimer molecules of water vapor. Dimer absorption also explains the $(1/\lambda)_{ij} = 49.5 \text{ cm}^{-1}$ absorption line which is observed in the spectrograms

UDC: 539.194:621.371.166.2

Card 1/2

ACC NR: AP7002382

of water vapor. This absorption line cannot belong to the absorption spectrum of monomer water vapor. Orig. art. has: 1 figure and 1 formula.

SUB CODE: 17,09/ SUBM DATE: 07Feb66/ ORIG REF: 009/ OTH REF: 010
ATD PRESS: 5111

Card 2/2

ZHEVAKO, Vasilii Trofimovich; GUSEVA, N.P., red.; ZLOBIN, M.V., tekhn. red.

[My experience in fattening cattle] Moi opyt nagula krupnogo rogatogo skota. Alma-Ata, Kazakhskoe gos. izd-vo, 1956. 8 p. (MIRA 11:7)

1. Pastukh nagul'nogo gurta kolkhoza "Torzhestvo truda", Zhana-Semeyakogo rayona, Semipalatinskoy oblasti. (for Zhevako).
(Kazakhstan--Cattle--Feeding and feeding stuffs)

ZHEVANDROV, N. D.

36/49795

USSR/Physics

Optics

Molecular Structures

Jan/Feb 49

"Influence of Molecular Structure of 9,10-Diaryl-Diamino Anthracenes on Their Optical Properties,"
N. D. Zhevandrov, V. I. Levshin, and K. K. Morgova,
Phys Inst Imeni P. N. Lebedev, Acad Sci USSR, 18 pp
"Is At Fizik SSSR, Ser Fiz" Vol XIII, No 1

Extensive investigation established following results: Introduction of substituents into side chains of diaryl-diamino derivatives of anthracene had a marked influence on optical characteristics of their molecules, absorption and radiation

36/49795

USSR/Physics (Contd)

Jan/Feb 49

spectra, luminescence yield, and duration of excited state. Nature of substitute had greatest influence, although position of substitute in side chain was also a factor. Duration of excited state in compounds studied varied from $8.6 \cdot 10^{-9}$ to $1.4 \cdot 10^{-9}$ sec. Luminescence yield in crystalline state was very high; in fact, it approached the maximum possible. Thus, concentrated extinguishing was almost lacking in the crystal state. Succeeded in comparing separate sections of spectra with different excitation conditions for the molecule.

36/49795

ZHEVANDROV, N. D.

PA 174T54

USSR/Physics - Spectrum, Absorption
Anthracene

1 Sep 50

"Polarization Spectra of Anthracene Derivatives,"
N. D. Zhevandrov

"Dok Ak Nauk SSSR" Vol LXXIV, No 1, pp 25-28

Discusses polarization and absorption spectra of 10
arylamine deriv of anthracene: (9, 10-dichlorophenyl-
diamino anthracene, 9, 10-di-alpha-naphthyl diamino
anthracene, etc.) For wave lengths between 2,500
and 5,000 A. Submitted 6 Jul 50 by Acad S. I. Vavilov.

174T54

ZHEVANDROV, N. D.

ZHEVANDROV, N. D. -- "Connection of the Luminescence Polarization and Other Optical Properties of Anthracene Derivatives With Its Structure." Sub 11, Jan 52, Physics Inst imeni P. N. Lebedev, Acad Sci USSR. (Dissertation for the Degree of Candidate in Physicomathematical Sciences).

SO: Vechernaya Moskva January-December 1952

USSR/Physics - Fluorescence, Organic Crystals 11 Apr 52

"Polarization of Fluorescence of Organic Crystals,"
M. D. Zhevandrov, Phys Inst imeni Lebedev, Acad Sci
USSR

"Dok Ak Nauk SSSR" Vol LXXXII, No 5, pp 677-680

Investigates 15 compds: anthracene and certain of
its derivs, mainly arylamine, derivs of phthalimide,
carbasol, and silicic acid. Also investigates uranyl
sulfate, an inorg compd. Conducted control expts to
det the depolarizing action of the apparatus: opti-
cal system (Reichert's luminescent microscope and

218782

USSR/Physics - Fluorescence, Organic Crystals (Contd) 11 Apr 52

Cornu polarimeter constituted the main parts of app)
Acknowledges the helpful advice of his supervisor,
Prof V. I. Levshin, and M. D. Galanin. Submitted by
Acad A. N. Terenin 20 Feb 52.

218782

ZHEVANDROV, M. D.

(PA 56 no. 668:5401.53)

ZHEVANDROV, N.L.

Polarization (light) Fluorescence

Polarization of the fluorescence of organic crystals. Dokl. AN SSSR 83 No. 5., 1952.
Fizicheskii Institut Im. P.N. Lebedeva Akademii Nauk SSSR rod. 26 Nov. 1951.

Monthly List of Russian Accessions, Library of Congress, August 1952, Unclassified

ZHEVANDROV, N.D.

K-5

Category : USSR/Optics - Physical Optics

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4952

Author : Gribkov, V.I., Zhevandrov, N.D.

Title : Investigation of Polarization Characteristics of Luminescence of Complex Organic Molecules by Photoelectric Methods.

Orig Pub : Dokl. AN SSSR, 1954, 98, No 4, 565-568

Abstract : Description of a photoelectric installation for the measurement of the degree of polarization of luminescence, analogous to that employed earlier by L.A. Spektorov (Dokl AN SSSR, 1949, 65, 485). The light of the luminescence passes through a modulating device, consisting of bi-quartz and a stationary analyzer, and is incident on the photocathode of a multiplier, connected to an amplifier to a cathode-ray oscillograph. Measurements were made by compensating for the polarization with two rotating stacks of glass plates. The setup described was used to investigate the dependence of the degree of polarization of the luminescence on the wavelength of the exciting light (Polarization spectra) for viscous solutions of anthracene, phenanthrene, dixanthylene, dioxynaphthalazine, 2-(oxyphenyl)-benzoxazole, and 3-aminophthalimide. Comparison

Card : 1/2

P.N. Lebedev Physics Inst.

Category : USSR/Optics - Physical Optics

K-5

Abs Jour : Ref Zhur - Fizika, No 2, 1957, No 4952

of the polarization spectra with the absorption spectra has led the authors to propose a hypothesis concerning the direction of the oscillators, responsible for the absorption and radiation of the light. Investigation of the dependence of the polarization of the luminescence on the temperature and on the viscosity of the solution and a fluorometric determination of the duration of the excited states have permitted the authors to calculate the effective volumes of the molecules of the investigated substances.

Card : 2/2

ZHEVANDROV, N.D.

Relation of the structure of anthracene derivatives to their
polarization of luminescence and other optical properties. Trudy
Fiz. inst. 6:121-198 '55. (MLBA 9:5)
(Anthracene--Optical properties)

Title

Periodical

Abstract

Keywords

Zhevandrov, N.D.

K-5

USSR/Optics - Physical Optics

Abs Jour : Referat Zhur - Fizika, No 5, 1957, 12945

Author : Zhevandrov, N.D.

Inst : Physics Institute, Academy of Sciences, USSR

Title : Effect of Migration of Energy on the Polarization of
Fluorescence of Single Crystals.

Orig Pub : Dokl. AN SSSR, 1955, 100, No 3, 455-458

Abstract : It is established that the polarization of fluorescence of organic single crystals is independent of the polarization of the exciting light. It is explained by the migration of the energy of excitation in the crystal. It is shown that this independence is retained for various wavelengths of exciting light. The degree of polarization of the fluorescence in the case of natural excitation is also independent of the wavelength of the exciting light.

Card 1/2

ZHEVANDROV, N.D.

Polarization spectra of some naphthylamines and polyenes. Izv. AN SSSR
Ser.fiz.no.5:570-573 '56. (MIRA 9:9)

1. Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR.
(Carotenoids--Spectra) (Naphthylamine--Spectra)

ZHEVANDROV, N.D.
USSR/Physical Chemistry - Crystals

B-5

Abs Jour : Referat Zhur - Khimiya, No 1, 1958, 245
Author : N.D. Zhevandrov.
Inst : Academy of Sciences of USSR
Title : Polarization Graphs of Luminiscence of Molecular Mono-crystals.
Orig Pub : Izv. AN SSSR, Ser. fiz. 1956, 20, No 5, 553-563
Abstract : An attempt was made to determine the orientation of molecules in anthracene crystals by polarization spectra of its fluorescence. The results agree qualitatively with that of x-ray diffraction study.

Card 1/1

ZHEVANDROV, N.D., kandidat fiziko-matematicheskikh nauk (Moskva)

A valuable book on optics ("The eye and the sun" by S.I. Vavilov.
Reviewed by N.D. Zhevandrov). Priroda 46 no.3¹¹⁸ Mr '57.

(Sight)

(Sun)

(MIRA 10:3)

(Vavilov, S.I.)

AUTHOR

ZHEVANDROV N.D., NIKOLAYEV V.P.

20-5-22/67

TITLE

On the Problem of the Determination of the Volumes of the Molecules in Solutions With the Aid of the Method of the Polarized Luminescence. (K voprosu ob opredelenii ob'yemov molekul v rastvorakh metodom polarizirovannoy lyuminestsentsii.- Russian)

PERIODICAL

Doklady Akademii Nauk SSSR 1957, Vol 113, Nr 5, pp 1025-1028 (USSR).

ABSTRACT

The measurements of the polarization of the fluorescence of one and the same fluorescent substance in different solvents permits us to draw conclusions with regard to the existence and the character of the solvate covers. A solvate cover is the monomolecular layer of the solvent which surrounds the molecule of the solved substance and which has a more or less strong connection with it. The paper under review measures the polarization of the fluorescence with the aid of a KAVRAYSKIY-polaroscope with compensating staple in the temperature interval between 20 and 60 degrees centigrade. In this interval the linearity of $1/p(T\eta)$ was well confirmed. Here p stands for the degree of polarization, T for the temperature and η for the viscosity. In this temperature interval it was possible to use as solvents (which must have a sufficiently high viscosity) only glycerine, castor oil and vaseline oil. The concentration of the solutions amounted to 10^{-4} to 10^{-5} g/cm³. Three groups of fluorescent organic substances were investigated: Phthalimides, acridine

CARD 1/3

20-5-22/67

On the Problem of the Determination of the Volumes of the Molecules in the Solutions With the Aid of the Method of the Polarized Luminescence.

derivatives and anthracene derivatives, altogether nine substances. A diagram contains a clear representation of the dependence of the inverse degree of polarization ($1/p$) on (T/η) for one of these substances. The obtained data are compiled in a chart. If we compute the mean radii r' of the molecules with the aid of the known lengths of the bindings and of the structural formula, then we obtain the following approximate estimate:

Substance r' in A	Phthalimides 2	Acridine 3	Anthracene 5
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In the same way it is possible to estimate the dimensions of the molecules of the solvent. The effective volumes of the molecules of the different classes increase with growing complexity of the structure. It is not possible to explain unambiguously by the concept of the solvate cover the experimental results obtained. But there exists another possibility of interpreting these results, namely from the point of view of the difference between the macromolecules

CARD 2/3

20-5-22/67
On the Problem of the Determination of the Volumes of the
Molecules in the Solutions With the Aid of the Method of the
Polarized Luminescence.

copio and the molecular viscosities. (1 reproduction, 1 chart)

ASSOCIATION: Institute of Physics "P.N. LEBEDEV", Academy of Sciences of the
USSR.

PRESENTED BY: A.N. TEREININ, Member of the Academy, 28.11. 1956

SUBMITTED: 23.11. 1956

AVAILABLE: Library of Congress.

CARD 3/3

ZHEVANDROV, N. D.

20-6-17/48

AUTHORS: Varfolomeyeva, V. N., Zhevandrov, N. D.

TITLE: Polarization Diagrams of the Luminescence of the Monocrystals of Stilbene (Polarizatsionnyye diagrammy lyuminestsentsii monokristallov stil'bena)

PERIODICAL: Doklady AN SSSR, 1957, Vol. 115, Nr 6, pp. 1115 - 1118 (USSR)

ABSTRACT: Investigations discussed here were carried out with spherical stilbene crystals. For the purpose of stimulating the luminescence in the center, the spheres were intersected in diagonal planes with a certain direction. The polarization diagrams were taken by a polarization-goniometric apparatus. First the dependence of polarization on the torsion angle of the crystal (round a horizontal axis) was measured at each hemisphere and then the positions of the crystal with such orientation was ascertained at which the polarization has the maximum positive or the maximum negative value. The stilbene monocrystals serving for the production of the samples were raised in soldered test-tubes according to the method of Obreimov-Shubnikov. The large monocrystals were divided into several smaller pieces. These spheres were intersected into

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Polarization Diagrams of the Luminescence of the Monocrystals of Stilbene

hemispheres in the following planes: I - in the plane of the optical axes. II - square with the bisector of the acute angle between the optical axes. III - square with the bisector of the obtuse angle between the optical axes. Then something is said on the theoretical computation of the azimuthal dependences and of the polarization diagrams of the luminescence. Then a sketch illustrates the computed positive and negative polarization diagrams for all of the three sections mentioned above. A second sketch contains the corresponding diagrams that have been measured by experiment. There is a good conformity qualitative of the corresponding diagrams. Because of this good qualitative conformity the determination of the orientation of the molecules in the crystal lattices of the polarization of the luminescence can be considered. That is, a new method for the determination of the structure of the crystal is obtained thereby. But the theoretical and experimental curves do not correspond quantitatively, maybe because of the influence of the temperature and the thermal oscillations of the molecules. There are 2 figures, 4 references, 3 of which are Slavic.

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Polarization Diagrams of the Luminescence of the Monocrystals of Stilbene ^{20-6-17/48}

ASSOCIATION: Physical Institute imeni P.N. Lebedev, AN USSR - Institute for Crystallography, AN USSR
(Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR, Institut kristallografii Akademii nauk SSSR)

PRESENTED: April 5, 1957, by A.V. Shubnikov, Academician

SUBMITTED: March 27, 1957

AVAILABLE: Library of Congress

Card 3/3

SOV/51-5-5-12/23

AUTHORS: Varfolomeyeva, V.N. and Zhevandrov, N.D.

TITLE: Spatial Distribution of Polarization of Luminescence from Stilbene and Tolane Crystals (Prostranstvennoye raspredeleniye polarizatsii lyuminestsentsii kristallov stil'bena i tolana)

PERIODICAL: Optika i Spektroskopiya, 1968, Vol 5, Nr 5, pp 571-581 (USSR)

ABSTRACT: In contrast to polarization in isotropic solutions, polarization of fluorescence of molecular crystals does not depend on anisotropy of excitation. The only spatial dependence of polarization in molecular crystals is the dependence on the angle between the direction of absorption and some other fixed direction. The graphical representation of this dependence is called a polarization diagram. The authors obtained polarization diagrams for luminescence of spherical crystals of stilbene and tolane. In order to excite a crystal only at the centre of the sphere, the spheres were cut in half along certain crystallographic planes and the plane of the cut was covered with a diaphragm so that only a small area of 1-2 mm diameter was excited at the centre of the sphere. The spheres themselves were from 5 to 10 mm in radius. The crystals were excited on the plane side and polarization of luminescence was measured on the spherical side.

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SOV/51-5-5-12/23

Spatial Distribution of Polarization of Luminescence from Stilbene and Tolane Crystals

Polarization diagrams were obtained using apparatus based on a goniometer and a Cornu polarimeter. Luminescence was excited using the 365 mμ Hg line. The hemispherical samples were prepared from stilbene and tolane monocrystals. The directions of the optical axes were found by the method described by Shubnikov (Ref 2) and these directions were used to prepare the samples in such a way that the hemispheres were cut along one of the following planes: (1) the plane of the optical axes, (2) the plane normal to the bisector of the acute angle between the optical axes, and (3) at right-angles to the bisector of the obtuse angle between the optical axes. Figs 1 and 7 show the coordinates used in calculation of polarization diagrams (Fig 1) and depolarization by thermal vibrations (Fig 7). Figs 2 and 3 give the calculated polarization diagrams for stilbene and tolane respectively. Figs 4 and 5 give the experimental polarization diagrams for stilbene and tolane respectively. Fig 6 gives the polarization diagrams calculated for the case of an oscillator oriented along the transverse axis of the stilbene molecule. The degree of polarization

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SOV/51-5-5-12/23

Spatial Distribution of Polarization of Luminescence from Stilbene and Tolane Crystals

was also measured for certain other crystals such as anthracene which contained some naphthacene (Fig 8), 1,10-dibromoanthracene and 3-dimethylamino-6-aminophthalimide at room temperature, and at the temperature of liquid nitrogen. Within the experimental error polarization is the same at both temperatures. Analysis of all the polarization diagrams shows that both localized and free excitons take part in the process of luminescence. The relative intensity and polarization for free excitons was obtained for anthracene, which contained naphthacene (Fig 9). There are 9 figures and 16 references, 9 of which are Soviet, 3 American, 2 French, 1 English and 1 Italian (mostly from American).

SUBMITTED: November 18, 1957

Card 3/3

1. Stilbene crystals--Luminescence
2. Tolane crystals--Luminescence
3. Luminescence--Polarization
4. Mathematics

24(2), 24(1)

SOV/48-22-11-12/33

AUTHOR:

Znevandrov, N. D.

TITLE:

Investigation of the Role Played by Localized and Free Excitons in the Luminescence of Molecular Crystals by Polarization Methods (Issledovaniye roli lokalizovannykh i svobodnykh eksitonov v lyuminesstentsii molekulyarnykh kristallov polyarizatsionnymi metodami)

PERIODICAL:

Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol 22, Nr 11, pp 1332-1336 (USSR)

ABSTRACT:

The author investigated the spatial distribution of the polarization of luminescence at a varying orientation of the crystals (so-called polarization diagrams). It proved indispensable to compute considerable correction factors for double refraction, which resulted in a considerable distortion of the actual polarization of luminescence. The information collected indicates that the corrected experimental curves and the curves calculated from X-ray analysis data take the same qualitative course, that they, however, do not agree quantitatively. When computing the polarization curves from X-ray analysis data it is assumed that the polarization of luminescence

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SOV/48-22-11-12/33

Investigation of the Role Played by Localized and Free Excitons in the
Luminescence of Molecular Crystals by Polarization Methods

is exclusively dependent upon the symmetry of the molecules and upon their orientation in the lattice, that is to say, that the luminescence is caused by localized excitons. If, however, free excitons also participate in luminescence, the polarization of the total radiation will be different, because the transitions corresponding to the free excitons are polarized as the crystallographical axes. The degree of total polarization will decrease if the exciton polarization is oriented parallel to the crystallographical axis and it will increase if it is perpendicular to this axis. If this point of view is adopted the polarization curves can be used in the investigation of the role played by localized and free excitons in luminescence phenomena. By means of these curves it is possible to determine the axis directions in which the radiation of the free excitons is polarized and the relative intensity of this radiation. Using the relation between the degree of polarization of the total luminescence and the radiation of localized and free excitons it is possible to compute the intensity of the latter by employing the well-known formula for the addition of the

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Investigation of the Role Played by Localized and Free Excitons in the
Luminescence of Molecular Crystals by Polarization Methods

polarization degrees: $P = \sum_1 I_1 P_1 / \sum_1 I_1$

The computation demonstrates that the radiation of localized excitons is responsible for 60-70% of the total luminescence. The two radiation components of free excitons are polarized in the direction of the b and c' axes, each contributing 15-20% to the total luminescence. The intensity of the first component is somewhat in excess of the other. If the assumption due to Agranovich (Ref 9) is adopted that in activated crystals of a anthracene-naphthacene type the transfer of excitation energy from the intrinsic material to the impurity is effected by free excitons, then it may be expected that the relative radiation intensity of the localized excitons in the intrinsic material will increase. Hence the degree of polarization of the luminescence of the intrinsic material must increase with a higher concentration of the impurity. The experimental evidence confirmed this assumption. There are 4 figures and 10 references, 7 of which are Soviet.

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SOV/48-22-11-12/33

Investigation of the Role Played by Localized and Free Excitons in the
Luminescence of Molecular Crystals by Polarization Methods

ASSOCIATION: Fizicheskiy institut imeni P. N. Lebedeva Akademii nauk SSSR
(Institute of Physics imeni P. N. Lebedev, AS USSR)

Card 4/4

24(7)

SOV/48-22-11-33/33

AUTHORS:

Zhevandrov, N. D., Galanin, M. D., Sevchenko, A. N.

TITLE:

Discussion of the Lectures Held by A. M. Sarzhevskiy, A. N. Sevchenko, and P. F. Nepochatykh (Preniya po dokladam A. M. Sarzhevskogo i A. N. Sevchenko; P. F. Nepochatykh)

PERIODICAL:

Izvestiya Akademii nauk SSSR, Seriya fizicheskaya, 1958, Vol 22, Nr 11, pp 1420-1420 (USSR)

ABSTRACT:

N. D. Zhevandrov comments on the lecture by A. M. Sarzhevskiy and A. N. Sevchenko: The divergence between the molecular volumes determined experimentally can easily be explained, as the data presented in the respective papers were obtained after an interruption of three years and with different lots of glycerin. As regards the interpretation of the results with respect to the solvate shells or with respect to the macro- and micro-viscosity, this seems to be only hair-splitting, because the physical nature of the phenomenon is essentially that of the interaction of the fields of the dissolved molecules and of the solvent molecules.

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M. D. Galanin advances remarks concerning the above mentioned lectures: He criticises the application of Perren's formula to

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Discussion of the Lectures Held by A. M. Sarzhevskiy, A. N. Sevchenko, and
P. F. Nepochatykh

the determination of the molecular volume and in particular to a decision on the problem of the solvate shells. An agreement between the values of molecular volumes determined and the actual volumes of the molecules can only be expected to keep within the range of orders of magnitude. In this connection the results must be taken for an indication of the fact that micro- and macro-viscosity are about equal.

A. N. Sevchenko answers: The information provided gives rise to the assertion that the shape of the molecules in the solvent is approximately spherical. The fact that the solvate shell volumes found by independent methods (Perren, Marinasco, agree with each other may serve as direct proof of the accuracy of the respective methods. Hence the remarks by M. D. Galanin are not convincing.

Card 2/2

USCOMM-DC 60,863

DERKACHEVA, L.D.; ZHEVANDROV, N.D.; KHAN-MAGOMETOVA, Sh.D.

A fluorescence method for determining small quantities of bacteria
[with summary in English]. Biofizika 4 no.1:117-119 Ja '59.
(MIRA 12:1)

1. Institut biologicheskoy fiziki AN SSSR, Moskva i Fizicheskoy
institut im. P.N. Lebedeva AN SSSR, Moskva.

(BACTERIA,

determ. of small quantities by luminescent
method (Rus))

(LUMINESCENCE,

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of bact. (Rus))

24(7)

AUTHORS:

SOV/48-23-1-11/36
Zhevandrov, N. D., Gribkov, V. I., Varfolomeyeva, V. N.

TITLE:

On the Polarization Dependence of the Fluorescence of Molecular Crystals on the Radiated Wave Length (O zavisimosti polarizatsii fluorestsentsii molekulyarnykh kristallov ot dliny volny izlucheniya)

PERIODICAL:

Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1959, Vol 23, Nr 1, pp 57 - 61 (USSR)

ABSTRACT:

In a previous paper (Ref 1) the authors tried to explain the importance of free and localized excitons to the luminescence of molecular crystals. On the basis of the amount of the "ratio of polarization" (the ratio of intensity of the components according to the individual crystal axes) which greatly differs in free and localized excitons (Ref 3), both excitons can be identified by polarization. In the present paper the spectral dependence of the luminescence polarization of molecular crystals was investigated. At the same time, the degree of luminescence polarization and its intensity were measured. The investigation covered stilbene and anthracene. For stilbene, polarization is

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On the Polarization Dependence of the Fluorescence of
Molecular Crystals on the Radiated Wave Length

SOV/48-23-1-11/36

almost constantly positive (+70%) within the long-wave range, whereas it becomes negative (-95%) within the short-wave range and at the end of the band. According to the results the authors arrived at the conclusion that short-wave luminescence with the polarization $\sim -100\%$ is determined by the free excitons, while long-wave luminescence depends on the localized excitons. The result of the determination of the short-wave spectrum by free excitons is in accordance with theory (Ref 6). In the case of anthracene, the polarization dependence of polarization on the wave length is somewhat more complicated. There is a marked polarization maximum within the short-wave range. At the end of the short-wave band the polarization declines rapidly down to 0, at low temperatures it remains somewhat higher. For investigating these problems it is necessary to clarify the orientation of crystals in detail and to pass to low temperatures. There are 4 figures and 11 references, 7 of which are Soviet.

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AUTHORS:

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Gribkov, V.I. and Zhevandrov, V.I.
On the Polarization of Luminescence of ZnS Monocrystals

TITLE:

PERIODICAL:

Optika i spektroskopiya, 1960, Vol 8, Nr 2,
pp 275 - 276 (USSR)

ABSTRACT:

The paper reports an investigation of the polarization of luminescence of ZnS monocrystals activated with copper and prepared by Ye.I. Panasyuk (Ref 1). Measurements of the degree of polarization were carried out using apparatus based on a microscope and a Cornu polarimeter (Ref 2). Some of the crystals were several mm in size so they could be investigated without the use of a microscope. Measurements of the azimuthal dependence of polarization (i.e. dependence of the degree of polarization on the angle of rotation of the crystal about an axis perpendicular to its surface and coinciding with the direction in which the polarization is measured) makes it possible to find such orientation of the crystal for which the degree of polarization is greatest. This maximum polarization was found to be roughly equal (~20%) for various samples; this value agrees with Lempicki's work

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On the Polarization of Luminescence of ZnS Monocrystals

(Ref 3). Moreover, both the azimuthal dependence and the maximum degree of polarization were found to be the same when luminescence was excited with different wavelengths, 436, 405, 365 and 313 mμ. The absolute values of the positive and negative extrema of the azimuthal dependence should be the same. However, Lempicki's results (Ref 3) do not agree with this conclusion: on excitation with polarized light the negative extremum amounts to -3% degree of polarization and the positive extremum is +20%; when crystals are excited with natural light the degree of polarization is 2%. The cause of this behaviour is still not clear. It may be due to imperfections in the crystal or it may be the result of dependence of the polarization of luminescence on the polarization of exciting light. The present authors investigated dependence of the polarization of luminescence of ZnS monocrystals on the position of the electric vector in the exciting light. In this case the crystal was always oriented in the same way and a nicol was rotated about an appropriate axis (exciting light was

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On the Polarization of Luminescence of ZnS Monocrystals

passed through this nicol). The results are shown in Figure 1 where the degree of polarization P is plotted against the angular position of the electric vector in the exciting light of the 365 mμ wavelength. For two different orientations of the sample, two straight lines were obtained indicating independence of the polarization of luminescence of the polarization of crystals. The degrees of polarization of luminescence of crystals excited with polarized light are the same as in the case when natural light is used to excite them. This seems to contradict Antonov-Romanovskiy's suggestion (Ref 4) that on excitation with polarized light only the centres of definite orientations are ionized and electrons can recombine only with such centres; the orientation of these centres is governed by the position of the electric vector of the exciting light. Consequently, the polarization of luminescence should, according to Antonov-Romanovskiy, depend on the polarization of excitation. However, if we allow for the fact that apart from migration of electrons there is also migration of holes (migration of

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On the Polarization of Luminescence of ZnS Monocrystals

the state of ionization from centre to centre), we see there is no contradiction between Antonov-Romanovskiy's theory and experiment. Independence of the polarization of luminescence of ZnS monocrystals of the polarization of exciting light can be interpreted as due to migration of the excitation energy across the crystal. This still leaves the mechanism of such migration quite open: it could be an exciton mechanism or an electron-hole mechanism. Measurements of the degree of polarization along a luminescence spectrum showed that polarization is constant within the experimental error throughout the spectrum (Figure 2). These measurements were carried out using apparatus consisting of a monochromator, a double-image prism and two photomultipliers recording two mutually perpendicular components of the electric vector of luminescence. Qualitative observations indicated that afterglow has the same degree of polarization as luminescence

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ZnS Monocrystals

On the Polarization of Luminescence of ZnS Monocrystals during excitation. Acknowledgment is made to Ye. I. Panayuk for supplying the crystals. There are 2 figures and 4 references, 2 of which are Soviet, 1 English and 1 French.

SUBMITTED: July 18, 1959

Card 5/5

81281

S/048/60/024/05/08/009
B006/B017

24.3500

AUTHORS: Khan-Magometova, Sh. D., Zhevandrov, N. D., Gribkov, V. I.

TITLE: The Effect of Beta Irradiation¹⁹ on the Photoluminescence²⁰ of Molecular Crystals

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960, Vol. 24, No. 5, pp. 561-566

TEXT: The present article is a reproduction of a lecture delivered at the Eighth Conference on Luminescence (Minsk, October 19-24, 1959). The effect of intensity reduction of the photoluminescence of molecular crystals has already been clarified and investigated. Since one author could not observe this effect in beta irradiation of anthracene, while another author did, the authors of the present paper again carried out investigations on this subject and reported on their results. Crystals of pure anthracene and anthracene + naphthacene with different naphthacene concentrations were used for this purpose. The radioisotope

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The Effect of Beta Irradiation on the
Photoluminescence of Molecular Crystals

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$\text{Sr}^{90} \rightarrow \gamma^{90}$ (25 mC and 100 mC, respectively, mean β -energy 0.9 Mev, maximum β -energy 2.2 Mev) and H^3 (0.37 and 3.4 curies, mean energy 5.5 kev, maximum 18 kev) with a maximum irradiation dose of $2 \cdot 10^6$ rad (Sr^{90}) and $3.5 \cdot 10^{10}$ rad (H^3) served as a beta source. Several series were investigated of all samples, naphthene concentration was kept between 10^{-5} and $5 \cdot 10^{-3}$ g/g, photoluminescence was excited with $\lambda = 365 \text{ m}\mu$, and its spectrum was measured before and after beta irradiation. Irradiation lasted longer than 3-6 days. Single crystals, blocks containing single crystals, and pulverized samples were measured. Results are illustrated in diagrams. Irradiation of pure anthracene led to an appreciable reduction of the luminescence spectrum ($I_1/I_0 = 16\%$). In a mixed crystal with 10^{-4} g/g naphthacene $I_1/I_0 = 71\%$, at a naphthacene content of $5 \cdot 10^{-3}$ g/g the ratio attains 95%, i.e., luminescence is practically not reduced. Similar results were obtained by irradiation with a tritium source. Further investigations showed that this reduction is an irreversible

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The Effect of Beta Irradiation on the
Photoluminescence of Molecular Crystals

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process and the result of a yield reduction. The fact that this effect is prevented by the presence of naphthalene impurities (which are often contained in anthracene) explains the different results of the investigations mentioned at the beginning. Two hypotheses are discussed for the purpose of explaining the affection of luminescence by irradiation:

- 1) formation of inactively absorbing non-luminescent molecules, and
- 2) formation of extinction centers capturing the excitons. Finally,

experiments on irradiation with the strong H^3 source and the resulting intensity reductions in luminescence of the samples are described (Fig. 2 shows the luminescence spectra before and after the irradiation); also the spectral dependence of luminescence polarization before and after irradiation is investigated (Fig. 3) as well as the dependence of intensity reduction on the radiation dose (Fig. 4; with increasing dose I_1/I_0 shows an exponential drop). As may be seen from Fig. 3, irradiation has no influence on the shape of the spectrum, and only the intensity is reduced. In conclusion, the authors thank G. B. Radziyevskiy for his assistance. M. D. Galanin, Z. A. Chizhikova, I. Ya. Kucherov, and

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The Effect of Beta Irradiation on the
Photoluminescence of Molecular Crystals

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B006/B017

A. N. Faydysh are mentioned. There are 4 figures and 10 references:
3 Soviet and 6 British.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of
Sciences, USSR)

4

Card 4/4

S/048/50/024/006/023/030/XX
B013/B067

AUTHORS: Gribkov, V. I., Zhevandrov, N. D., and Khan-Magometova, Sh.D.

TITLE: Polarization Characteristics of the Luminescence²¹ of
Molecular Crystals in Various Spectral Regions

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1960,
Vol. 24, No. 6, pp. 740-744

TEXT: This paper is a continuation of the studies of free and localized excitons in the luminescence of molecular crystals which were begun in Refs. 1 and 2. The spectropolarimetric, photoelectric apparatus described in Ref. 2 was used for the investigations. First, the authors measured the spectral dependence of polarization of the luminescence excited at $\lambda = 365 \text{ m}\mu$ in stilbene crystals which were cut out in the direction of various crystallographic planes (Fig. 1). Furthermore, the authors measured the dichroism spectra of the stilbene crystal plates investigated (Fig. 2). On the basis of the investigations it may be assumed that the strong change in polarization observed on the short-wave edge of the spectrum is not connected with the admixture of the exciting light.

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Polarization Characteristics of the Luminescence of Molecular Crystals in Various Spectral Regions

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B013/B067

Furthermore, the dichroism of reabsorption of luminescence must be taken into account. For the correction of the change in the actual polarization of luminescence due to the dichroism of reabsorption, well-known formulas derived by Förster (Ref. 3) may be used which have already been used for molecular single crystals. The spectral dependence of polarization on the edge of the luminescence spectrum is given in Fig. 3, taking account of the corresponding corrections. The strong change in polarization in spite of the correction indicates that the luminescence of the stilbene crystal shows the emission of free excitons. A study of the photo- and β -excited (with Sr^{90}) polarization of luminescence has shown that the mechanism of luminescence does not depend on the nature of excitation and that the polarization of luminescence depends mainly on the properties of the crystal. The authors also studied the spectral dependence of polarization in compound anthracene and naphthacene crystals. The results obtained for one of the naphthacene concentrations are given in Fig. 4. The change in polarization in the spectral region of anthracene is the same as that found for pure anthracene. In the spectral region of naphthacene, no

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Polarization Characteristics of the Luminescence of Molecular Crystals in Various Spectral Regions

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B013/B067

strong change may be observed in polarization. It may be assumed that the orientation of the naphthacene molecules in the lattice differs from that of the anthracene molecules. Fig. 5 gives the spectral dependence of the luminescence polarization of benzyl crystals at room temperature. Polarization increases in the direction of the short-wave edge, and attains 20% at the end of the spectrum. To determine a possible ellipticity, the polarization was analyzed by the ordinary method and by means of $\lambda/4$ plates (Ref. 9). Elliptical polarization could be observed neither in summational luminescence of the benzyl crystal nor in the individual sections of the spectrum, neither at room temperature nor at the temperature of liquid nitrogen. The same negative result was obtained in analyzing the summational luminescence of glycerin solutions of optically active substances - tryptophane and riboflavin. Hence, the elliptical polarization of luminescence of an optically active substance as described in Ref. 7 remains a single case. The present paper was read at the Eighth Conference on Luminescence (Molecular Luminescence and Luminescence Analysis) which took place in Minsk from October 19 to 24, 1959. There are 4 figures and 9 references: 5 Soviet, 3 German, and 1 Indian.

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Polarization Characteristics of the Luminescence of Molecular Crystals in Various Spectral Regions

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B013/B067

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Institute of Physics imeni P. N. Lebedev of the Academy
of Sciences USSR)

Card 4/4

GRIKOV, V.I.; ZHEVANDROV, N.D.; KHAN-MAGOMETOVA, Sh.D.

Luminescence polarization of molecular crystals under β -ray
excitation. Opt. i spektr. 10 no.4:549-551 Ap '61. (MIRA 14:3)
(Luminescence) (Beta rays)
(Crystals—Spectra)

243500 (1137,1138)

32049
S/051/61/011/005/009/018
E202/E192

AUTHORS: Zhevandrov, N.D., Gribkov, V.I., and
Khan-Magometova, I.D.

TITLE: The influence of excitation light birefringence on
the polarisation of the luminescence of the molecular
crystals

PERIODICAL: Optika i spektroskopiya, v.11, no.5, 1961, 629-635

TEXT: The authors have shown that in molecular crystals
luminescence polarisation does not depend on the excited light
polarisation. This independence is completely general, and
exists in the presence or absence of other complicating factors
such as double refraction, dichroism or optical activity. This
behaviour is explained by the migration of the energy of
excitation in the crystals. In the case of double refraction,
the electrical vector during its rotation will in turn coincide
with the oscillators of various orientation causing a uniform
excitation of the latter independent of the initial position of
the exciting electrical vector. Stilbene crystal was selected
for the spectro-polarimetric experimentation, which confirmed

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The influence of excitation light ... the independence of the luminescence polarisation of the exciting light polarisation. The object of the second experiment was to direct the exciting light along the optical axis of the crystal. Single crystals of monoaxial benzyl, and biaxial stilbene were used, and again it was shown that in both cases the luminescence polarisation does not depend on the polarisation of the exciting light. There are 6 figures, 1 table and 10 references; 8 Soviet-bloc and 2 non-Soviet-bloc. The English language reference reads as follows:
Ref.9; G.S. Chandrasekhar. Proc. Ind. Acad. Sci., v.39, 243, 1954.

SUBMITTED: December 26, 1960

Card 2/2

ZHEVANDROV, N.D.

Achievements of the Soviet school of luminescence. Vest. AN SSSR
31 no.10:130-131 0 '61. (MIRA 14:9)
(Luminescence--Congresses)

S/051/62/013/001/007/019
E039/E420


AUTHORS: Zhevandrov, N.D., Gribkov, V.I., Khan-Magometova, Sh.D.

TITLE: The migration of energy between impurity molecules in
molecular crystals

PERIODICAL: Optika i spektroskopiya, v.13, no.1, 1962, 96-99

TEXT: It has previously been shown that the polarization of fluorescence of molecular crystals is independent of the position of the electric vector of the exciting light. This is made use of in the present paper to investigate the migration of energy between impurity molecules where the distances at small concentrations are many times the lattice constant. Measurements of polarization were made with a spectro-polarimetric photoelectric apparatus described in a previous paper. It is shown that for the largest investigated concentration of naphthalene in anthracene (10^{-3} g/g eq.) the degree of polarization of the luminescence does not depend on the position of the electric vector in the exciting light. From this it is concluded that migration of energy of excitation proceeds between

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The migration of energy ...

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E039/E420

naphthalene molecules which are, on the average, a distance of $10d$ apart (d is the lattice constant $\sim 8 \text{ \AA}$ for anthracene). Measurements are also made on crystals of anthracene with naphthalene concentrations of 2×10^{-4} and 6×10^{-5} g/g eq. The question of the migration being dependent on an inductive resonance mechanism, as in liquid solutions, is discussed. There are 5 figures and 1 table. ✓

SUBMITTED: May 22, 1961

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33420

S/048/62/026/001/006/018
B125/B104

24,3500 (1137,1138,1144)

AUTHOR: Zhevandrov, N. D.

TITLE: Studies of activation energy migration in molecular crystals with the aid of luminescence polarization

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 1, 1962, 67-73

TEXT: The polarization techniques of S. I. Vavilov et al. (limiting polarization, polarization diagram, polarization spectra) give valuable information on the structure and properties of emitters and also on their interaction with the ambient medium. Detailed spectroscopic studies of A. F. Prikhod'ko, V. L. Broude et al. at Kiyev have confirmed important results of the theory of light absorption in molecular crystals, developed by Davydov and associates. These results include the Davydov term splitting, production of free excitons in crystals as a result of light absorption, and the strong effect of lattice defects on luminescence. The multipole properties of elementary emitters can be derived from the polarization diagram, i. e., from the spatial distribu-
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tion of luminescence polarization. A goniometric polarization device has now been used to examine the spatial distribution of luminescence polarization of anthracene, anthracene + naphthanene, stilbene, and tolane. Polarization diagrams can be calculated for every direction of a single crystal if, e. g., X-ray structural data on the orientation of molecules in the lattice of these crystals are used, and if the position of the radiation oscillator in the molecule is known. The experimentally calculated degree of polarization is always less than the theoretical value. The basic features of the model of the oriented gas are probably valid. According to experiments on single crystals of numerous substances, the luminescence polarization is often independent of the position of the exciting electric vector, owing to intermolecular energy migration in the crystal. With the aid of a technique specially developed by the author it could be proved that in crystals with a high concentration of luminescent admixture (anthracene or naphthacene), energy migrates up to concentrations of $6 \cdot 10^{-5}$ g/g, which corresponds to a mean distance of 26 d ($= 208 \text{ \AA}$, d = lattice constant). The migration of holes in the lattice explains the author's observation that, like in

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Studies of activation energy ...

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molecular crystals, the luminescence polarization of ZnS single crystals is independent of the polarization of the exciting light. The luminescence polarization of molecular crystals is also independent of the wavelength of the exciting light. In beta excitation, free excitons affect the luminescence of molecular crystals less than in the case of photoluminescence. The investigation of molecular crystals by the polarization techniques described here has indicated that the model of oriented gas can be applied to the luminescence of molecular crystals in first approximation, i. e., the localized excitons play the main role. Migration of energy takes place between pure and mixed crystals, and free excitons participate in the luminescence of molecular crystals. There are 6 figures and 16 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR) *

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GRIKOV, V.I.; ZHEVANDROV, N.D.; CHEBOTAREVA, Ye.I.

Luminescence polarization in stilbene single crystals as dependent on the wavelength of the radiation at the temperature of liquid nitrogen. Izv.AN SSSR.Ser.fiz. 27 no.4:515-518 Ap '63. (MIRA 16:4)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.
(Stilbene crystals—Spectra) (Low temperature research)

ABSTRACT The X-ray diffraction pattern of the compound

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(Ys. T. Mazurenko) arrang. migration of the ...

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L 10773-63

ACCESSION NR: AP3002797

(M. M. Val'dman and G. D. Sheremet'yev): use of isoparaffin to produce sharp spectra
of alpha and beta-methylisopropylbenzene (7) [Sov. J. Chem. Phys. 1963, 39, 1000]

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 15Jul63

ENCL: 00

SUB CODE: 00

NO REF SOV: 000

OTHER: 000

/For Complete Set See: 11th Conference on Luminescence⁷_{IV}

Set 1/2, Card 4/4

EMP(j)/EFF(c)/EWT(m)/BDS ASD Pc-4/Pr-4 RM, Wn

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5 0001 13 014 000 0835 1838

ACCESSION NR: AP3002797

AUTHOR: Gurinovich, G. P.; Zhevandrov, V. D.; Solov'yev, K. N.

TITLE: 11th Conference on Luminescence [Held at Minsk, 10--15 September 1962]

SOURCE: Optika i spektroskopiya, v. 14, no. 6, 1963, 835-838

TOPIC TAGS: molecular luminescence, stimulated emission, triplet state, laser

ABSTRACT: VI. LUMINESCENCE OF ORGANIC VAPORS: excited states in the gas phase

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19952-63 EWA(k)/EWP(k)/EWP(q)/EWT(m)/BD3/T-2/EEC(b)-2/ES(t)-2--AFFTC/
 ASD/ESD-3/RADC/APGC/AFWL/IJP(C)/3W2--Pf-4/P1-4/Pq-4--GG/WH/JHB/WG/K
 ACCESSION NR: AP3006795 S/0053/63/080/004/0685/0701

AUTHOR: Gurinovich, G. P.; Zhevandrov, N. D.; Solov'yev, K. N.

TITLE: 11th Conference on Luminescence (Molecular luminescence and luminescence analysis) [Minsk, 10-15 Sep 1962]

SOURCE: Uspekhi fizicheskikh nauk, v. 80, no. 4, 1963, 685-701

TOPIC TAGS: laser research, laser resonant cavity, luminescence, inorganic laser material, luminescence conference, laser oscillation condition, molecular crystal laser, ruby laser, glass neodymium laser, Mossbauer effect, organic laser material, triplet state, chlorophyll luminescence, albumen luminescence, luminescence research

ABSTRACT: The XI Soveshchaniye po lyuminesentsii (11th Conference on Luminescence) was held 10-15 September 1962 in Minsk. More than 370 participants took part, and more than 180 reports were presented. Considerable attention was paid to lasers. A series of theoretical works concerning the properties of absorption and emission at high radiation intensities and the theory of

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ACCESSION NR: AP3006795

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a resonator in which an active substance is placed were presented by the Institut fiziki AN BSSR (Institute of Physics, AN BSSR). P. A. Apanasevich in his report on the dependence of absorption, emission, and scattering of radiation on the intensity of incident radiation gave the derivation by the method of quantum electrodynamics of the dependence of absorption and dependence of scattering and photo-luminescence characteristics on the spectral composition and intensity of incident nonmonochromatic radiation absorbed by the medium and on the probability of nonoptical transitions. In the report of G. S. Kruglik and P. A. Apanasevich on the problem of coherent spontaneous emission, the conditions under which coherent spontaneous emission with an intensity proportional to the square of the number of emitted particles were discussed, and it was shown that under general conditions such emission is impossible. The report of V. P. Gribovskiy on forced anisotropy of the absorption coefficient was devoted to properties of the absorption coefficient at high intensities, and it was shown that the absorption coefficients of a linearly polarized or a natural light coincide with absorption coefficients of isotropic radiation

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only at low or very high intensities. The report of B. I. Stepanov and coworkers on the oscillation of an inorganic plane-parallel layer dealt with the theory of laser resonators. Results of the solution of transport equations and Maxwell equations for inorganic layers with a negative absorption coefficient in the absence of outside radiation were given. The conditions for a stationary oscillation were obtained; by calculating the nonlinear dependence of the absorption coefficient on the radiation density, the values for density and energy release inside the layer under conditions of stationary oscillation were determined. The conditions for flows of different directions and frequencies were investigated. In the work of B. I. Stepanov, A. M. Samson, and Yu. I. Chkalinskaya on the effect of noises on the oscillation of a bounded plane-parallel layer, the light field inside and outside the resonator in the presence of noises was discussed. In the report of Khapalyuk on the possibility of generation of radiation by a system of plane-parallel plates, self-luminescence of a pile of plane-parallel plates with positive as well as negative absorption coefficients was analyzed. The report of B. I. Stepanov, A. M.

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"Samson," and V. P. Gribkovskiy on the effect of characteristics of a substance on the properties of generated radiation was concerned with properties of an active substance inside the resonator. The pump power, absorption, luminescence, and the power and oscillation threshold of a plane-parallel layer with three energy levels were calculated. In the work of V. L. Broude, V. S. Mashkevich, A. F. Prikhod'ko, N. F. Prokopyuk, and M. S. Soskin on induced radiation in molecular crystals, a four-level scheme for a quantum generator was discussed. It was shown that optical properties of molecular crystals provide a basis for the realization of a quantum generator. In the report of A. M. Samson and V. A. Savva on nonstationary luminescence of an oscillating plane-parallel layer, laser luminescence kinetics were discussed. In the report of M. D. Galinin, A. M. Leontovich, E. A. Sviridenkov, V. N. Smorchkov, and Z. A. Chizhikova on radiation properties of a ruby crystal laser, the kinetics of generation at room temperature and low temperature (down to -165C) and properties of radiation coherence in a ruby laser were investigated. The report of A. M. Bonch-Bruyevich, V. V. Vargin, Ya. A. Imas, G. O. Karapetyan, Ya. E. Karis, M. N.

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Tolstoy, and P. P. Feofilov on luminescence and induced radiation of a glass activated by neodymium discussed absorption and luminescence spectra of glass containing 0.1—10% neodymium. Stimulated emission in the region of 1.06 μ , observed in specimens, was investigated at room and nitrogen temperatures. K. K. Rabane and V. V. Khizhnyakov in their report presented results from theoretical investigations of the Mössbauer effect. The authors succeeded in discovering an analogy between Shpol'skiy's effect, electron-vibrational transitions in impurity centers of ionic crystals, and the Mössbauer effect. A new version of the theory of diffusion quenching of fluorescence in a solution by means of foreign substances was offered in the report of B. Ya. Sveshnikov (deceased), A. S. Selivanenko, V. I. Shirokov, and L. A. Kiyanskaya. Other reports presented during the conference on molecular luminescence can be grouped as follows: theory of molecular luminescence; luminescence of molecular crystals; quasi-line spectra of frozen solutions; yield and quenching of luminescence of solutions; luminescence of vapors of organic compounds; the influence of the association of molecules,

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the solvent, and other physicochemical factors on luminescence; triplet states; luminescence of chlorophyll, albumons, and other important biological compounds; molecular luminescence of inorganic compounds; and molecular luminescence and chemical problems (relationship between luminescence and molecular structure, chemiluminescence, etc.). Reports on luminescence analysis can be grouped as follows: luminescence analysis in chemistry; luminescence analysis in biology, medicine, microbiology, and veterinary medicine; luminescence analysis in technology, industry, and geology; and instruments and methods of luminescence analysis.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 30Sep63

ENCL: 00

SUB CODE: PH

NO REF SOV: 000

OTHER: 000

Card 6/6

ZHEVANDROV, N.D.

Polarized luminescence of molecular crystals. Trudy Fiz. inst.
25,3-151 '64. (MIRA 17:4)

"APPROVED FOR RELEASE: 03/15/2001

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VREDEN-KOBETSKAYA, T.O.; GEORGOBIANI, A.N.; GCLUBEVA, N.P.;
GRIGOR'YEV, N.N.; ZHEVANDROV, N.D.; MORGENSHTERN, Z.L.;
PETUKHOVA, M.S.; RABINOVICH, N.Ia.; FOK, M.V.;
KHAN-MAGOMETOVA, Sh.D.; ANTONOV-ROMANOVSKIY, V.V., doktor
fiz.-mat. nauk, otv. red.

[Luminescence; a bibliographic index for 1947-1961] Liu-
minestsentsia; bibliograficheskii ukazatel', 1947-1961.
Moskva, Nauka. Vol.2. 1964. 378 p. (MIRA 18:4)

1. Akademiya nauk SSSR. Sektor seti spetsial'nykh bibliotek.

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